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A PRELIMINARY ANALYSIS OF THE ECONOMIC IMPACT ON THE ELECTRIC UTILITY INDUSTRY OF ALTERNATIVE APPROACHES TO SIGNIFICANT DETERIORATION

ENVIRONMENTAL PROTECTION AGENCY

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by

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The Senate and House significant deterioration proposals will not prevent the construction of new coal-fired power plants. Rather, the Senate and House proposals will require many new power plants to employ different air pollution control strategies (i.e., construction of smaller plants, relocation at alternative sites, further control of sulfur dioxide emissions, etc.). While the use of such control strategies will impose additional costs on the electric utility industry and on the consumers of electricity, these additional expenditures must be balanced against the health and welfare benefits that would result from preventing the degradation of air quality up to the national ambient air quality standards. The public policy issue, therefore, is to compare the costs and benefits that would result from the implementation of alternative significant deterioration policies.

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PREFACE

This report is being released at this time as a preliminary assessment because of the need to further refine the analysis in specific areas, update the analysis based on final changes by the Congressional committees, and coordinate the findings of this study with the second Project Independence report which is soon to be released.

The principal methodological issue which will be addressed relates to the determination of the cost of the Senate and House proposals assuming EPA's current definition of best available control technology (BACT). It should be noted, however, that the cost of the Senate and House proposals (i.e., including the Senate and House definition of BACT) is not an outstanding analytical issue.

With regards to the Project Independence study, new forecasts regarding electric demand, coal burning power plant capacity, and regional coal development will be provided in the upcoming report. Any differences between the estimates provided herein, and the projections provided in the Project Independence report must be reconciled.

EPA will release the final assessment of the impact of the Senate and House significant determination proposals as soon as the remaining analytical issues have been addressed.

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I. Introduction and Conclusions

A. Introduction

In 1972, the Sierra Club and other environmental groups filed suit against EPA for failure to promulgate regulations under the Clean Air Act to prevent the significant deterioration of air quality. Both the District Court of the District of Columbia and the U.S. Court of Appeals for the District of Columbia Circuit granted the Sierra Club's motion and required EPA to promulgate significant deterioration regulations. In June 1973, the Supreme Court, by a four-to-four vote, affirmed the judgement of the Court of Appeals.

After extensive public participation and technical and economic analyses, EPA published final regulations in December 1974, 1/ which are based on allowable increments of pollutant concentrations for specific categories of new major industrial sources under an area classification procedure. Subsequently, the Administration, as part of the Energy Independence Act of 1975, requested Congress to consider legislation which would clarify Congressional intent on the prevention of significant deterioration of air quality. The Administration requested that Congress carefully examine the potential effects of a significant deterioration policy, including the consideration of its complete elimination as well as other alternative approaches. In addition, Congress was asked to provide guidance that would allow a balancing of environmental, economic, and energy concerns in any legislative determination of the significant deterioration issue.

In the course of debate on the significant deterioration issue, both the Senate and House subcommittees have proposed plans 2/ which, although similar in many respects to EPA's promulgated regulations, appear to have different impacts, especially on new coal-fired power plants.

An earlier report 3/ prepared jointly by the Environmental Protection Agency and the Federal Energy Administration analyzed the possible impacts of the EPA, Senate and House significant deterioration approaches on the electric utility industry. In the absence of economic cost and air quality benefit data, the original EPA/FEA report used two indicators to quantify the impact of alternative significant deterioration proposals: (1) land area that may be affected, and (2) projected power plant capacity that may be affected. This report is a follow-up of the initial report and estimates the economic/energy costs on the electric

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1/ See Significant Deterioration Regulations Published (40 CFR Part 52); 39 FR 42510; December 16, 1974.

2/ Senate Staff Working Print No. 6, entitled "Clean Air Act Amendments as of 1975," December 22, 1975.

H. R. 10498 (Clean Air Act Amendments of 1975), October 31, 1975.

3/ An Analysis of the Impact on the Electric Utility Industry of Alternative Approaches to Significant Deterioration: Volume I and Volume II; EPA and FEA, October, 1975.

utility industry of alternative approaches to significant deterioration. A subsequent report by EPA will analyze the health and welfare benefits that would result from preventing degradation of air quality up to the national ambient air quality standards. It should be noted that this report does not address the impact of alternative significant deterioration proposals on other industrial facilities such as petroleum refineries, synthetic fuel plants, steel mills, and non-ferrous smelters.

B. Conclusions

As stated in the previous EPA/FEA study, 1/ the Senate and House significant deterioration proposals will not prevent the construction of new coal-fired power plants. Rather, the Senate and House proposals will require many new power plants to employ different air pollution control strategies (i.e., construction of smaller plants, relocation at alternative sites, further control of sulfur dioxide emissions, etc.). While the use of such control strategies will impose additional costs on the electric utility industry and on the consumers of electricity, these additional expenditures must be balanced against the health and welfare benefits that would result from preventing the degradation of air quality up to the national ambient air quality standards. The public policy issue, therefore, is to compare the costs and benefits that would result from the implementation of alternative significant deterioration policies.

The principal findings of this study are:

1. Capital Investment:

The Senate proposal will increase the electric utility industry's capital requirements over the next 15 years (1975-1990) by about $11.5 billion dollars. This represents an increase of approximately 2.6% in the industry's projected capital requirements. The comparative figure for for the House proposal is between $11.2 and $11.6 billion which is equivalent to an increase in the industry's projected capital requirements of between 2.5 and 2.7%. 2/

2. Consumer Costs:

Both the Senate and House proposals will increase the average residential customer's yearly expenditures (both direct and indirect) for electricity in 1990 by approximately $28 per year. This is equivalent to an increase of about 2.3%.

1/ op cit, Volumes I and II.

2/ The high estimate for the House proposal assumes that all new plants must meet the Class I and II increments and that no areas will be redesignated as Class III. The low estimate for the House proposal assumes that the area in the vicinity of all plants which cannot meet the Class II increment will be redesignated as Class III. The low estimate also assumes that the background concentration of sulfur dioxide is less than 25% of the ambient air quality standards.

3. Energy Costs:

o The current requirements of the Clean Air Act (i.e., in the absence of significant deterioration requirements) would require the installation of 175,000 megawatts of scrubbers over the next 15 years. The Senate and House proposal would increase the demand for scrubbers in the 1975 to 1990 period by approximately 95,000 megawatts. The energy needed to operate the scrubbers required by the House and Senate proposals would result in the construction of another 3,300 megawatts of coal-fired capacity by 1990 (an increase of .8%) and the consumption of an additional 7.9 million tons per year of coal in 1990 (an increase of .6%).

o The Senate and House proposals will reduce the demand for western coal in 1990 by about 35 million tons which is equivalent to a 5% reduction in the currently projected 1990 western coal production of 690 million tons. This reduction in demand for western coal is caused by the definition of best available control technology (BACT) in the House probably require all new coal-fired power plants to install a scrubber. Therefore, some plants, especially those in the mid-west, which formerly were planning to import western low-sulfur coal in order to meet the requirements of the Clean Air Act will find it more economical to use local high sulfur coal and install a scrubber. As a result the demand for midwestern coal will increase by 25 million tons or by 20%.

4. Major Policy Issues:

The economic and energy impacts of the Senate and House proposals would be reduced considerably if EPA's current definition of best available control technology (i.e., New Source Performance Standards or state regulations where more stringent than New Source Performance Standards is 1/) was substituted for the Senate and House definition (i.e., maximum degree of emission control). Specifically, the capital requirements of the Senate proposal would be reduced from $11.5 to $2.1 billion and the capital requirements of the House proposal would be reduced from between $11.2 and $11.6 billion to between $1.2

1/ The nine states are Arizona, Connecticut, Hawaii, Massachusetts, Nevada, New Jersey, New Mexico, Rhode Island and Wyoming. It should be noted, however, that major power plants in Montana and Utah are planning to meet regulations more stringent than NSPS and that a number of metropolitan areas also have tighter regulations than NSPS for coal-fired power plants.

and $1.7 billion. 1/ Similarly, the incremental (i.e., over the current provisions of the Clean Air Act) demand for scrubbers in 1990 would be reduced from 95,000 to 5,000 megawatts under the Senate proposal and to a maximum of 10,000 megawatts under the House proposal.

o The principal environmental impact that would result from the incorporation of EPA's definition of best available control technology (BACT) would be that emissions of sulfur dioxide from power plants would be reduced only 17% by 1990 as compared to a reduction of 35% which would occur with the Senate and House definition of BACT.

1/ The estimates of the impact of the significant deterioration requirements with EPA's definition of BACT are based upon a number of preliminary assumptions concerning the feasibility and costs of relocating power plants from sites that may have been selected in the absence of the significant deterioration requirements. The basic issue is the magnitude of the additional costs that would be incurred when future plants chose to locate at alternative sites. More detailed analysis of the siting issue is underway and the estimates of the impact of EPA's definition of BACT will be revised once this on-going analysis is completed. It is assumed that such costs will be increased somewhat but still remain well below the cost estimates provided for the Senate and House proposals as drafted. Finally, it should be noted that the cost estimates for the Senate and House proposals (i.e., with the Senate and House definition of BACT) will not be affected by the resolution of the siting issue.

6. Alternative Policies for the Prevention of Significant Deterioration and Related Policy Issues

This study analyzes the economic costs on the electric utility industry of the specific provisions of the Senate and House proposals 1/ which are summarized in Tables II-1, II-2, and II-3. Also for purposes of comparison, EPA's regulations have been described.

As indicated in Table II-1, the general approach to "significant deterioration" taken by EPA and by the Congressional Subcommittees is similar, although numeric limits and coverage vary considerably. In all cases, significant deterioration is prevented by establishing area classifications designed to correspond to the overall air quality intended for the area, and to reflect the amount of energy or industrial growth desired. These "classes" were established by the EPA regulations as follows:

- Class I - Applies to areas in which practically any air quality deterioration would be considered significant, thus allowing little or no energy or industrial development.
- Class II - Applies to areas in which deterioration that would normally accompany moderate, well-controlled growth would not be considered significant.
- Class III - Applies to areas in which deterioration would be permitted to allow concentrated or very large scale energy or industrial development, as long as the national secondary ambient air quality standards are not exceeded.

It should be noted that a critical aspect of the EPA regulations is that all regions are initially designated as Class II, subject to redesignation as Class I or Class III by initiative at the State and local level. EPA anticipated that Class I designations would be made to protect existing clean air resources in areas such as national parks and wilderness areas, and the Class III redesignations would occur where State or local policies called for extensive industrial development, requiring increment air quality increases up to the national ambient air quality standards. To date, no known formal application has been made by communities, states or Federal land managers to reclassify regions to the Class I or Class III designations.

1/ Senate Staff Working Print No. 6, entitled "Clean Air Act Amendments of 1975", December 22, 1975.

H. R. 10498 (Clean Air Act Amendments of 1975), October 31, 1975.

TABLE II-1: ALLOWABLE AIR QUALITY INCREMENTS UNDER ALTERNATIVE SIGNIFICANT DETERIORATION PROPOSALS
($\mu g/m^3$)

Pollutant Standard	CLASS I			CLASS II			CLASS III		
	EPA Regs.	Senate Proposal	House Proposal 1/	EPA Regs.	Senate Proposal	House Proposal 1/	EPA Regs 2/	Senate Proposal	House Proposal
Sulfur Dioxide									
Annual	2	2	1.6	15	15	20	60	No Class III	40
24-hour	5	5	7.3	100	100	91	365		182
3-hour	25	25	26	700	700	325	1300		650
Total Suspended Particulates									
Annual	5	5	7.5	10	10	19	75	No Class III	38
24-hour	10	10	15	30	30	38	150		75

1/ The increments for the House proposal are based on limitations of 2% of NAAQS for Class I, 25% for Class II, and 50% for Class III, except that the limit for total suspended particulates in Class I is 10% of NAAQS. In addition, the House proposal stipulates that the concentration of all pollutants cannot exceed 75% of the national ambient air quality standards in any of the classes.

2/ EPA's Class III allows degradation up to the NAAQS:

	Sulfur Dioxide	TSP
Annual	80 (primary)	75 (primary)
24-hour*	365 (primary)	150* (secondary)
3-hour*	1300 (secondary)	

* The 24-hour and 3-hour standards are not to be exceeded more than once per year. There is no primary 3-hour standard for sulfur dioxide and particulates, nor is there a 24-hour primary standard for pollutants.

TABLE II-2

CLASS I AREAS UNDER SENATE AND HOUSE APPROACHES
TO SIGNIFICANT DETERIORATION

Land Category	Senate (Working Draft No. 6)	H. R. 10498
o International Parks	Mandatory Class I (If 1,000+ acres)	Class I; Provision for redesignation as Class II (If 1,000+ acres)
o National Parks	Mandatory Class I (If 1,000+ acres)	Mandatory Class I (If 10,000+ acres)*
o National Wilderness Areas	Mandatory Class I (If 1,000+ acres)	Mandatory Class I (If 10,000+ acres)*
o National Wildlife Refuges	Mandatory Class I (If 1,000+ acres)	Class II; Provision for redesignation as Class I (If 1,000+ acres)
o National Monuments	Class I; Provision for redesignation as Class II	Class I; Provision for redesignation as Class II (If 10,000+ acres)**
o National Preserves	Class II; Provision for redesignation as Class I	Class I; Provision for redesignation as Class II (If 10,000+ acres)
o National Recreational Areas	Class I; Provision for redesignation as Class II	Class I; Provision for redesignation as Class II (If 10,000+ acres)**
o Wild and Scenic Rivers	Class I; Provision for redesignation as Class II	Class II; Provision for redesignation as Class I (If 1,000+ acres)
o National Forests	Class II; Provision for redesignation as Class I	Class II; Provision for redesignation as Class I (If 1,000+ acres)
o Military Reservations	Class II; Provision for redesignation as Class I	Class II; Provision for redesignation as Class I or Class III
o Other Federal Lands	Class II; Provision for redesignation as Class I	Class II; Provision for redesignation as Class I or Class III

* National Parks and Wilderness areas of between 1,000 and 10,000 acres in size are initially designated as Class I, but may be redesignated as Class II.

** National Monuments and National Recreational areas of between 1,000 and 10,000 acres in size are initially designated as Class II, but may be redesignated as Class I.

TABLE II-3

SUMMARY OF MAJOR DIFFERENCES OF ALTERNATIVE APPROACHES TO SIGNIFICANT DETERIORATION

Issues	EPA	House	Senate
Sources Covered	19 source categories	Any facility emitting more than 100 tons/yr. of any regulated pollutant	Major emitting facility
Pollutants Covered	TSP and SO_2	All	TSP, SO_2, others to be established later
Control Technology Requirements	Equivalent to NSPS where NSPS exist; and determined on a case-by-case basis where NSPS does not exist	Best available control technology; determined by the Administrator of EPA taking into account cost and energy impacts.	Maximum degree of emission control achievable; determined on a case-by-case basis
Class I Areas	No mandatory (at state and Federal discretion with procedures for full public participation)	Designation of some areas as mandatory Class I and others as either Class I, II or III (see Table II-2)	Designation of some areas as mandatory Class I and others as either Class I or Class II (see Table II-2)
Class III Areas	Procedures for designation of areas as Class III	Procedures for designation of areas as Class III	No Provision for Class III
Numeric Limitations for Class II	See Table II-1	See Table II-1	See Table II-1
Maximum Allowed Concentration	National Ambient Air Quality Standards Standards (NAAQS)	Three-fourths of National Ambient Air Quality Standards	National Ambient Air Quality Standards
Allowable Stack Height	No limitation on stack height if the source installs best available control technology	Stack height limited to 2 1/2 times the height of the source unless a higher stack is necessary to overcome the effect of nearby structures or terrain.	None specified

As indicated in Table II-1, the Senate numerical limits for Class I and II areas are the same as EPA's. However, the Senate approach has several substantial differences:

- o The Senate version eliminates Class III designations.
- o The Senate requires the designation of some areas of national importance as mandatory Class I and other areas as discretionary Class I unless they are redesignated by agreement between the States and the Federal government. (See Table II-2).

The House also adopts the EPA approach but contains the following differences:

- o The House has fewer mandatory Class I designations than the Senate. (See Table II-2).
- o The House version includes different numerical limits for the Class I and II increments, but the only significant difference is that the three-hour sulfur dioxide Class II increment is less than half of the EPA and Senate Class II increments. (See Table II-1).
- o The House, like EPA, has a Class III but the allowed increment is half EPA's increment. In addition, a general air quality ceiling of three-fourths of the national ambient air quality standards is imposed.

The other important differences among the alternative proposals are summarized in Table II-3. One of these is related to the control technology a new power plant must install regardless of the applicable air quality increment. While EPA's significant deterioration regulations require compliance with New Source Performance Standards (NSPS) or State regulations where they are more stringent than NSPS, the Senate requires the maximum degree of control technology achievable as determined on a case-by-case basis. Similarly, the House proposal requires the best available control technology which (taking into account cost, other environmental impacts, and energy requirements) the Administrator of EPA has determined to be adequately demonstrated. The Senate and House proposals, therefore, will probably require installation of the flue gas desulfurization systems (i.e., scrubbers) on practically all new coal-fired power plants, whereas EPA's significant deterioration regulations would not unless it was required by State law, necessary to meet national ambient air quality standards, or necessary to comply with the applicable air quality increments.

Another important difference is that the House proposal provides for limitations on the allowable stack height for new power plants. Specifically, the House proposal restricts the allowable stack height to two and a half times the height of the power plant unless the source can demonstrate that a greater height is necessary to insure that emissions from the source do not cause excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, and wakes.

III. Issues Evaluated

A number of issues have been raised as a result of the recent significant deterioration proposals that have been proposed by the Congress. The issues addressed in this analysis are as follows:

A. Issues Relating to Alternative Approaches to Significant Deterioration

1. Definition of Best Available Control Technology

The definition of best available control technology (i.e., the minimum degree of emission control required for new plants) will have a considerable impact on the control technology required to comply with alternative significant deterioration proposals and on the resultant economic and energy costs of the House and Senate proposals. For example, the definition of best available control technology (BACT) proposed by the Senate and House will probably require all new coal-fired plants to install flue gas desulfurization systems (i.e., scrubbers). By comparison, EPA's current definition of BACT (i.e., NSPS or state regulations where more stringent than NSPS) would allow the plant to choose the most cost-effective means of compliance (i.e., low sulfur coal or scrubbers) with the significant deterioration increments. It should be noted, however, that under either definition of BACT, new power plants would have to install whatever control technology that was required in order to comply with the applicable air quality increment (i.e., Class I, II, or III). Thus, the definition of BACT is only a relevant issue where more stringent emission controls than necessary to meet the applicable significant deterioration increments would be required.

2. Implications of Class I Area Designations

The designation of Class I areas is an issue because of the attendant areas of the country where power plant development may be affected. Class I areas have a significance beyond their geographic limits because the air quality increments that must be met within such areas can be violated, under certain circumstances, by large coal-fired power plants located some distance from a Class I area. The distance may range from less than 10 miles or up to 100 miles depending upon such factors as: plant size; the degree of emission control; neighboring terrain; and meteorological conditions.

3. Impact of Alternative Class II Increments

Alternative Class II increments are an issue because of the resulting impact on plant size, location and required degree of emission control. Of particular importance is the impact of the Class II increment on plants sited in areas of non-flat terrain.

4. Implications of Stack Height Limitations

Allowable stack height is important because a taller stack permits more diffusion of a power plant's emissions. Accordingly, restrictions by the Class II increment on the siting of power plants in areas of non-flat terrain could be minimized by the construction of taller stacks. Thus, for any assumed level or emission control, the use of taller stacks would allow the siting of larger plants. However, it should be noted that the use of tall stacks will result in greater emissions as compared to the use of continuous emission controls such as scrubbers and/or low sulfur coal.

B. Energy Policy Issues

1. Energy Requirements of Pollution Control Technology

The energy requirements of pollution control technology is an issue because the Congressional proposals for significant deterioration will require the installation of more scrubbers than would be required solely to comply with the current provisions of the Clean Air Act. Since about 4% of the plant's capacity would be required to operate the scrubbers, the additional use of scrubbers will require the construction of more generating capacity and the consumption of more coal. It is important to note, however, that the energy penalty due to significant deterioration requirements will not increase the electric utility industry's demand for oil, rather it will increase the demand for domestic coal.

2. Rate of Western Coal Development

The rate of western coal development is an issue because alternative significant deterioration policies will effect the demand for western coal. It is also important to assess the feasibility and desirability of expanding western coal production fast enough to meet the projected demand. In particular, it is necessary to analyze the institutional factors which will ultimately determine the actual level of western coal production.

IV. Study Methodology and Assumptions

A. Summary of Major Demand Estimates

In order to estimate the economic impact of alternative significant deterioration policies it was necessary to estimate the projected demand for electricity, and the projected demand for coal-fired generating capacity. Given the great uncertainty in forecasting such variables, this study developed cost estimates for three scenarios: a base case scenario; a nuclear moratorium scenario; and an energy conservation scenario. The demand estimates for these three scenarios are summarized in Table IV-1

Table IV-1

Summary of Projected Demands for Electricity and Generating Capacity: 1975-1990

	Projected Growth in Demand for Electricity (1975-1990)	Projected Growth in Demand for Peak Capacity (1975-1990)	Projected Coal & Nuclear Capacity (Thousand MW) 1/			
			Coal		Nuclear	
			1985	1990	1985	1990
Base Case	5.3%	5.2%	348	434	128	230
Nuclear Moratorium	5.3%	5.2%	367	558	108	108
Energy Conservation	4.2%	4.0%	323	363	112	166

As indicated in Table IV-1 the demand for electricity was projected to grow at 5.3% per year under the base case and nuclear moratorium scenarios and 4.2% per year under the energy conservation scenario. The comparative growth rates for peak demand under the three scenarios were 5.2%, 5.2%, and 4.0% per year respectively. The details of the projected growth in electricity sales, peak load capacity and capacity mix are discussed in Appendix A.

1/ Includes existing and new capacity.

B. Summary of Major Unit Cost Assumptions

The economic impact of alternative strategies on the electric utility industry was calculated based on the unit cost estimates presented in Table IV-2.

Table IV-2

Cost of Alternative Pollution Control Techniques [1] (1975 Dollars)

Method of Compliance	Capital Cost $/KW [2]	O&M Mills/ KWH	Energy Penalty (%)
Baseline (i.e., coal-fired plant with no pollution control)	$390	8.5	0
Low Sulfur Coal			
o Particulate	56.00	0.30	0.5%
o SO$_2$	12.50	2.15	0.0% [3]
TOTAL	68.50	2.45	0.5%
Scrubbers			
o Particulate	16.50	0.30	0.5%
o SO$_2$	60.00	1.50	3.5%
TOTAL	76.50	1.80	4.0%
Scrubbers Reduce/Relocate			
o Particulate	16.50	0.30	0.5%
o SO$_2$	70.-100.00 [4]	2.11	3.5%
TOTAL	$86.50-$116.50	2.41	4.0%

1/ Figures based on a forthcoming report by PEDCO Environmental on the cost of pollution control equipment.

2/ Based on 1985 start up date.

3/ Although no energy penalty is included for low sulfur coal, there is a small penalty for western low sulfur coal due to the need to transport the coal long distances by train and barge.

4/ Includes a relocation cost of $10 to 40/KW.

C. Summary of Analytical Approach and Major Assumptions

The analytical approach taken in this study is summarized in Figure IV-1. In general, the implications of the alternative significant deterioration policies are found by assessing the impact of the proposed policies on a sample of 74 coal-burning power plants that are scheduled to be built between 1975 and 1983. In view of the fact that most of the plants analyzed were planned prior to the proposed significant deterioration regulations, the geographic distribution and capacity of these plants can be considered to be representative of the power plant development that would occur in the absence of significant deterioration regulation during the 1980 to 1990 decade. Since the costs that would result from significant deterioration requirements would be in addition to those currently required under the Clean Air Act, the economic impacts of the House and Senate proposals were estimated by projecting the incremental costs required by the significant deterioration proposals.

In order to estimate the cost of alternative significant deterioration proposals, the following assumptions were made.

o In calculating the cost of compliance with the Clean Air Act, it was assumed that the power plants would adopt the most cost effective control strategy to meet the most stringent of Federal New Source Performance Standards (NSPS), the State Implementation Plan (SIP), or National Ambient Air Quality Standards (NAAQS).

o Both the Senate and House definition of best available control technology (BACT) were assumed to require compliance with regional emission limitations. Specifically, the emission limitations were assumed to be equivalent to low sulfur coal plus a scrubber in the west, and washed high sulfur coal (or medium sulfur coal) plus a scrubber in the rest of the country. The detailed coal assumptions are delineated in Appendix B. 1/

o Power plants would be permitted to use the entire allowed increment in the surrounding area. While this assumption tends to underestimate the impact of significant deterioration regulations, particularly if other sources such as synthetic fuel plants or other power plants would locate in the same area, the conservative assumptions used in the meteorological dispersion modeling analysis 2/ are believed to compensate for this understatement.

1/ See Supplement Report 3 to the EPA/FEA October report for a discussion of the land use and capacity impacts of the analysis.

2/ See Volume II, Appendices B and C for a discussion of the modeling techniques used.

o Power plants that could not comply with the significant deterioration requirements were assumed to either relocate part or all of the impacted power plant to another site and/or further reduce the level of emissions of sulfur dioxide through use of low sulfur coal and/or a scrubber. 1/ It is important to emphasize that it was not always possible to analyze every possible alternative site that would be available to the power plant. An average surcharge of 5% of the total capital cost of a new plant was added to the cost of impacted power plants scheduled to come on-line between 1980 and 1985 to reflect possible added expense in site selection, site related construction costs, and the environmental review process. 2/

o The impact of alternative significant deterioration proposals on the sample of 74 new coal-fired power plants is assumed to be indicative of the impact on the capacity additions projected to occur during the 1980 to 1990 time period. Implicit in this analysis is the assumption that significant deterioration requirements will be met by all power plants coming on-line after January 1, 1980. 3/

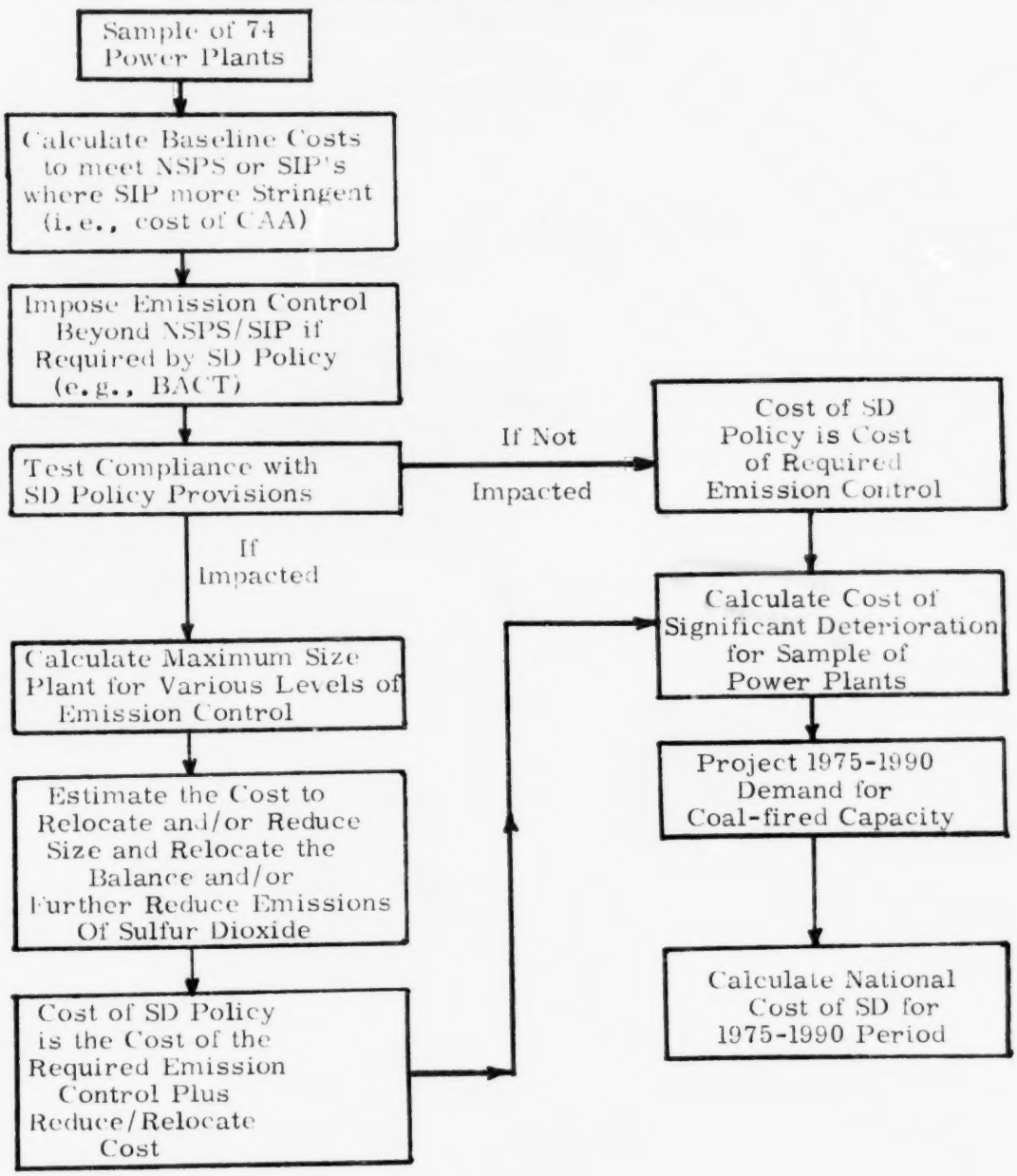
1/ Appendix C discusses the methodology used to estimate the incremental costs that may be incurred by plants impacted by alternative significant deterioration policies.

2/ The estimates of the impact of the significant deterioration requirements with EPA's definition of BACT are based upon a number of preliminary assumptions concerning the feasibility and costs of relocating power plants from sites that may have been selected in the absence of the significant deterioration requirements. The basic issue is the magnitude of the additional costs that would be incurred when future plants chose to locate at alternative sites. More detailed analysis of the siting issue is underway and the estimates of the impact of EPA's definition of BACT will be revised once this on-going analysis is completed. It is assumed that such costs will be increased somewhat but still remain well below the cost estimates provided for the Senate and House proposals as drafted. However, the cost estimates for the Senate and House proposals (i.e., with the Senate and House definition of BACT) will not be affected by the resolution of the siting issue.

3/ It should be noted that this assumption was made solely for analytical purposes and does not exactly correspond to EPA's guidelines which exempt those plants that have commenced construction prior to June 1, 1975 from the significant deterioration regulations.

Figure IV-1

Summary of Economic Analysis of Alternative Significant Deterioration (SD) Proposals


Sample of 74 Power Plants
Calculate Baseline Costs to meet NSPS or SIP's where SIP more Stringent (i.e., cost of CAA)
Impose Emission Control Beyond NSPS/SIP if Required by SD Policy (e.g., BACT)
Test Compliance with SD Policy Provisions
If Not Impacted
Cost of SD Policy is Cost of Required Emission Control
If Impacted
Calculate Maximum Size Plant for Various Levels of Emission Control
Estimate the Cost to Relocate and/or Reduce Size and Relocate the Balance and/or Further Reduce Emissions Of Sulfur Dioxide
Cost of SD Policy is the Cost of the Required Emission Control Plus Reduce/Relocate Cost
Calculate Cost of Significant Deterioration for Sample of Power Plants
Project 1975-1990 Demand for Coal-fired Capacity
Calculate National Cost of SD for 1975-1990 Period

V. FINDINGS OF THE ANALYSIS

A. Energy, Solid Waste, and Coal Development Impacts of Alternative Significant Deterioration Policies

1. Demand for Flue Gas Desulfurization Systems and Associated Energy Penalties

The impacts of alternative significant deterioration policies on the demand for flue gas desulfurization systems (scrubbers) are summarized in Table V-1.

Table V-1

Cumulative Demand for Scrubbers by 1990 (MW)

Policy Options	MW	%Increase
- Baseline (current provisions of Clean Air Act)	175,000	--
Incremental impact of Significant Deterioration Policies		
- Senate Proposal	+ 95,000	+55%
- House Proposal	+ 95,000	+55%
- Senate Proposal with current EPA definition of BACT 1/	+ 5,000	+ 3%
- House Proposal with current EPA definition of BACT 2/	+ 0 to 10,000	+ 0 to 6%

1/ Senate Class I and II provisions, assuming all plants at a minimum are required to meet EPA's current definition of BACT (i.e., Federal New Source Performance Standards (NSPS) or state regulations where they are more stringent than NSPS).

2/ House Class I, II, & III provisions, assuming all plants at a minimum are required to meet EPA's current definition of BACT (i.e., Federal New Source Performance Standards (NSPS) or state regulations where they are more stringent than NSPS). High end of the range for House proposal assumes all plants must meet the Class II increment while the lower end of the range assumes that the area in the vicinity of plants impacted by the Class II increments will be reclassified as a Class III area.

As indicated in Table V-1, the Clean Air Act without a significant deterioration provisions (i.e., baseline) is projected to require the installation of an additional 175,000 megawatts of scrubbers by 1990. This estimate assumes that approximately 60% of the new coal-fired plants will install scrubbers in order to meet NSPS or state regulations where more stringent than NSPS. The remaining 40% of the new plants will use low sulfur coal. The Senate and House proposals would require an additional 95,000 megawatts by 1990 (an increase of 55%). The impact of the Senate and House proposals on the demand for scrubbers is identical because it was assumed that under both proposals the definition of BACT would require scrubbers on all new plants.

It can also be concluded from Table V-1 that if the Senate and House proposals were to adopt EPA's current definition of best available control technology (i.e., NSPS or state regulations where more stringent), the impact of significant deterioration on the demand for scrubbers would be reduced considerably. Specifically, the Senate proposal would only require an additional 5,000 megawatts of scrubbers and the House proposal a maximum of 10,000 megawatts of scrubbers. Less scrubbers are needed under the EPA definition of BACT because some plants that are planning to use low sulfur coal can meet the significant deterioration requirements by relocating rather than substituting local high sulfur coal and installing a scrubber.

As discussed in Section IV, the installation of additional scrubbers will require additional energy and generating capacity to operate the scrubbers. However, it should be emphasized that the energy penalty will not increase the electric utility industry's demand for oil. Rather the energy penalty will affect only the demand for domestic coal.

As indicated in Table V-2, both the Senate and House proposals will increase the demand for new coal-fired capacity in 1990 by 3,300 megawatts. Based on the projections used in this report, the energy penalty would increase the demand for new coal-fired capacity in 1990 by about 0.8%. Table V-2 also shows that the Senate and House proposals would increase the demand for domestic coal in 1990 by 7.9 million tons. Based on the study's projections of coal production, this represents approximately a 0.6% increase in the projected U.S. coal consumption in 1990.

Table V-2

Cumulative Energy Penalty of Alternative Sigfnificant Deterioration Policies in 1990 1/

Policy Option	Capacity Penalty (MW)	Energy Penalty (million tons/yr)
- Baseline (i.e., current provisions of CAA)	6,250	15.0
Incremental Impact of Significant Deterioration		
- Senate Proposal	+ 3,300	+ 7.9
- House Proposal	+ 3,300	+ 7.9
- Senate Proposal with current EPA definition of BACT	+ 100	+ .2
- House Proposal with current EPA definition of BACT	+ 150	+ .3

It can also be concluded from the above table that the energy impact of the Congressional proposals would be reduced if EPA's current definition of BACT was substituted for the Senate and House's definition of BACT. The capacity penalty would be reduced to approximately 100 megawatts under the Senate proposal and 150 megawatts under the House proposal. Similarly, the energy penalty is reduced to .2 and .3 million tons respectively.

1/ Estimates are based on a projected energy and capacity penalty of .5% for particulates and 3.5% for scrubbers.

2. Solid Waste Requirements of Alternative Significant Deterioration Policies

In addition to the increased energy penalty associated with alternative approaches to significant deterioration, there will also be a need to dispose of additional tons of sludge. Although the cost of disposing of the additional sludge was included in the preceding economic analysis, the solid waste generated and the required land area for disposal is summarized in Table V-3.

Table V-3

Solid Waste Generated and Land Area Required by Alternative Approaches to Significant Deterioration 1/

Policy Option		Million Tons/Yr In 1990	Land Area Required/Yr In 1990 (Acres)
- Baseline (in the absence of Significant Deterioration)	Sludge	90	3,500
	Ash	125	2,700
		215	6,200
Incremental Impact of Significant Deterioration			
- Senate Proposal		+50	+2,000
- House Proposal		+50	+2,000
- Senate Proposal with current EPA definition of BACT		+ 3	+ 100
- House Proposal with current EPA definition of BACT		+ 6	+ 200

1/ Estimates are based on the following assumptions:

- o 80% of the scrubbers would be of the throwaway type and 20% of the regenerative type.
- o A throwaway scrubber produces 640,000 tons of sludge (50% solids) per year per 1,000 MW and requires 26 acres per year per 1,000 MW for sludge disposal. (Assuming a ponding depth of 20 feet.)
- o A 1,000 MW power plant produces 288 thousand dry tons of ash per year which requires 6.3 acres per year for disposal when 80% solid.

As indicated in Table V-3, the Senate and House proposals will produce an additional 50 million tons of sludge per year by 1990. Disposal of the sludge will require an additional 2,000 acres per year.

It can also be concluded from Table V-3 that a large part of the increased production of sludge results not from the significant deterioration requirements but rather from the Senate and House definition of BACT. If the Congressional significant deterioration proposals were to adopt EPA's current definition of BACT, then only an additional 3 to 6 million tons of sludge would be generated in 1990 and only an additional 100 to 200 acres per year would be required to dispose of this sludge.

3. Regional Coal Development

The impact of alternative significant deterioration policies on regional coal development is shown in Table V-4. The table shows the total production forecast for all coal uses.

Table V-4

Impact of Alternative Significant Deterioration Policies On Regional Coal Development (Million Tons/Year)

Policy Option	Coal Production by Region 1/					
	East		Midwest		West	
	1974	1990	1974	1990	1974	1990
- Baseline (current provisions of the Clean Air Act)	382	555	149	125	64	690
Incremental Impact of Significant Deterioration						
- Senate Proposal	-	0	-	+25	-	-35
- House Proposal 2/	-	0	-	+25	-	-35
- Senate or House Proposal with current EPA definition of BACT	Negligible Impact					

1/ For the purposes of this analysis the eastern region includes the coal fields of northern and southern appalachia; the mid-western region the coal fields of western Kentucky and Tennessee, Indiana, Illinois, Arkansas and Oklahoma; and the western region the coal fields of the Northern Plains, Texas, Southwest, and Washington.

2/ Total coal demand is 10 million tons less for the Senate and House proposals because less central coal is needed per ton of western coal to generate an equivalent amount of electricity.

As shown in Table V-4, in the absence of significant deterioration legislation (i.e., baseline) coal production over the next 15 years is projected to increase from 382 million to 555 million tons in the East, decrease from 149 to 125 million tons in the mid-west, and increase from 64 to 690 million tons in the West. It can also be concluded from Table V-4 that the Senate and House significant deterioration proposals would increase the demand for mid-western coal and decrease the demand for western coal. Specifically, the demand for mid-western coal would increase by 25 million tons or by 20%. In contrast, the demand for western coal would decrease by 35 million tons or by 5%.

This reduction in demand for western low sulfur coal is caused by the definition of BACT in the Senate and House proposals which will probably require all new coal-fired power plants to install a scrubber. Therefore, a number of plants, especially those in the mid-west, which formerly were planning to import western low-sulfur coal in order to meet the requirements of the Clean Air Act, will find it more economical to blend western medium sulfur coal with high sulfur and install a scrubber.

It can also be concluded from Table V-4 that under EPA's definition of BACT, the Senate and House significant deterioration requirements would have negligible impact on regional coal development. This effect occurs because power plants are able to comply with the significant deterioration requirements by relocating rather than substituting local high sulfur coal and installing a scrubber.

B. Economic Impact of Alternative Significant Deterioration Policies

1. Incremental Capital Investments

In the absence of environmental regulations, the capital expenditures of the electric utility industry over the next 15 years are projected to be about 400 billion dollars (1975 dollars). 1/ The current provisions of the Clean Air Act are expected to add another 35 billion in capital expenditures. 2/ The details of the baseline cost projections appear in Appendix A.

The incremental dollar capital requirements due to the Senate and House significant deterioration proposals are summarized in Table V-5.

1/ All cost estimates in this report are given in constant 1975 dollars.

2/ The Federal Water Pollution Control Act is projected to require an additional $6 million in capital expenditures between 1975 and 1990.

Table V-5

Incremental Capital Investment for Alternative Significant Deterioration Proposals; 1975-1990

Policy Option	Billion $1975	% Increase
- Baseline		
o Expenditures in the absence of Environmental regulations	$400	--
o Expenditures to meet current provisions of Clean Air Act (CAA)	$ 35	+8.8%
o Total expenditures in the absence of significant deterioration	$435	
Incremental Impact of Significant Deterioration Policies		% Increase Over Baseline
- Senate Proposal	$+11.5	2.6%
- House Proposal	$+11.2 - 11.6	2.5 - 2.7%
- Senate Proposal with current EPA definition of BACT 2/	$+2.1	0.5%
- House Proposal with current EPA definition of BACT 2/	$+1.2 - 1.7	0.3 - 0.4%

As indicated in Table V-5, the Senate proposal would require additional expenditures of $11.5 billion over the next 15 years. This would increase the utility industry's capital requirements by about 2.6%. Under the House proposal, the additional expenditures would range between $11.2 and $11.6 billion which would increase the industry's capital expenditures by between 2.5 and 2.7%. 1/ The high estimate for the House proposal assumes that all new plants must meet the Class I and II increments and that no areas will be redesignated as Class III.

1/ It should be noted that the Senate and House proposals will increase the capital requirements of the Clean Air Act by about 33%.

2/ The estimates of the impact of the Senate and House significant deterioration requirements with EPA's definition of BACT are based upon a number of preliminary assumptions concerning the feasibility and costs of relocating power plants from sites that may have been selected in the absence of the significant deterioration requirements. The basic issue is the magnitude of the additional costs that would be incurred when future plants chose to locate at alternative sites. More detailed analysis of the siting issue is underway and the estimates of the impact of EPA's definition of BACT will be revised once this on-going analysis is completed. It is assumed that such costs will be increased somewhat but still remain well below the costs estimates provided for the Senate and House proposals as drafted. However, the cost estimates for the Senate and House proposals (i.e., with the Senate and House definition of BACT) will not be affected by the resolution of the siting issue.

The low estimate assumes that the area in the vicinity of all plants which cannot meet the Class II increment will be redesignated as Class III. The low estimate also assumes that the background concentration of sulfur dioxide is less than 25% of the ambient air quality standards.

For purposes of comparison, estimates were also made for the Senate and House proposals assuming EPA's current definition of BACT. The results indicate that the impact of significant deterioration would be considerably reduced. For example, the Senate proposal would require capital expenditures of only $2.1 billion and the House proposal capital expenditures of only $1.2 to $1.7 billion.

2. Incremental Annual Costs

In the absence of environmental regulations, the operating costs of the electric utility industry over the next 15 years will be approximately $1,335 billion dollars. The current provisions of the Clean Air Act will add approximately an additional 105 billion. 1/

The incremental annual costs for alternative significant deterioration proposals are summarized below:

Table V-6

Incremental Annual Costs for Alternative Significant Deterioration Proposals: 1975-1990

Policy Option	Billion $1975	% Increase
- Baseline		
o Cumulative annual costs in the absence of Environmental regs.	$1,335	--
o Cumulative annual cost to meet current provisions of Clean Air Act	105	+ 7.9%
o Total cummulative annual cost in the absence of significant deterioration	$1,440	
Incremental Impact of Significant Deterioration Policies		**% Increase Over Baseline**
- Senate Proposal	+ $16.5	1.1%
- House Proposal	+$16.2 - 16.6	1.1 - 1.2%
- Senate Proposal with current EPA definition of BACT	+$2.4	0.2%
- House Proposal with current EPA definition of BACT	+$1.3 - 2.1	0.1 - 0.2%

1/ It should be noted that the Federal Water Pollution Control Act is projected to cost an additional $22 billion between 1975 and 1990.

As indicated in the above table, the Senate proposal would increase the utility industry's annual costs over the next 15 years by $16.5 billion or by approximately 1.1%. The comparative figures for the House proposal are $16.2 to $16.6 billion which is equivalent to an increase of 1.1 to 1.4%. As discussed in the previous section, the high estimate for the House proposal assumes that all plants would have to meet the Class I and II increments (i.e., no Class III) while the low estimate assumes that, where required, a Class III redesignation would be allowed and that the background concentration of sulfur dioxide is less than 25% of NAAQS.

For the purposes of comparison, an analysis was made of the Senate and House proposals assuming EPA's current definition of BACT. As in the previous section, the impact of significant deterioration was reduced substantially. Specifically, the cummulative annual cost of the Senate proposal would be reduced to $2.4 billion, while the cummulative cost of the House proposal would be reduced to between $1.3 and $2.1 billion.

3. Impact on the Consumer

The impact of the significant deterioration proposals on typical residential customers will be both of a direct and indirect nature. The residential customer's electric bill will go up in a direct sense because the significant deterioration requirements will increase the price he pays for electricity. However, there are indirect costs which will be passed on to him in the form of higher prices for the goods and services which he consumes. The direct and indirect impact on the average residential customer is estimated for each policy option in the following table.

Table V-7

Yearly Impact on the Average Residential Customer (1975 Dollars) in 1990 of Alternative Significant Deterioration Policies

Policy Option	Impact Direct	Impact Indirect	Impact Total	% Increase
- Baseline				
o Yearly expenditures in the absence of environmental regs.	$560	$560	$1,120	--
o Yearly expenditures to meet current provisions of Clean Air Act	+ 40	+ 40	+ 80 1/	7.1%
o Total yearly expenditures in the absence of significant deterioration	$600	$600	$1,200	
Incremental Impact of Significant Deterioration				
- Senate Proposal	$14	$14	$28	2.3%
- House Proposal	$14	$14	$28	2.3%
- Senate Proposal with current EPA definition of BACT	$ 1.50	$ 1.50	$ 3	0.3%
- House Proposal with current EPA definition of BACT	$ 1	$ 1	$ 2	0.2%

As indicated in the above Table, the Senate and House proposals would increase the average residential customer's electricity bill in 1990 by $14 or by about 2.3%. 2/ The total yearly impact (i.e., both indirect and direct) would be $28.

The analysis also indicates that if EPA's definition of BACT was substituted for the Senate and House definition, the total in 1990 would be reduced to approximately $3 per year under the Senate proposal and to around $2 per year under the House proposal.

1/ In 1990 the Federal Water Pollution Control Act will require an additional $20 in direct and indirect expenditures.

2/ It should be noted that the Senate and House proposals will increase the consumer impact of the Clean Air Act by about 33%.

C. Impact of Alternative Coal Growth Scenarios

1. Nuclear Moratorium Scenario

The estimates in the previous sections assume that nuclear capacity will increase from 41,000 megawatts in 1975 to 230,000 megawatts in 1990. However, there are several factors which may cause a reduction in the growth of nuclear capacity. First, in the last year, the utility industry has cancelled or delayed orders for over 20,000 megawatts of nuclear capacity. Given the current financial problems of the industry, this trend toward cancellation or deferral of nuclear capacity may continue. Second, the issue of nuclear power has become extremely controversial. In fact, in several states, the issue of legislative approval of nuclear power plants is on the ballot for the 1976 elections. If a number of states were to require legislative approval of the licensing process for nuclear plants, nuclear generating capacity may grow at a lower rate than previously expected.

In view of the uncertainty in the projected growth of nuclear capacity, this study has analyzed the implications of a low growth scenario for nuclear plants. Specifically, it was assumed that only existing nuclear capacity with approved operating permits would be allowed to be constructed. This results in a nuclear capacity in 1990 of only 108,000 megawatts. The implications of a low growth nuclear scenario on the capital and annual cost of alternative significant deterioration proposals are given in Table V-8.

Table V-8

Implications of a Nuclear Moratorium Scenario

Policy Option	Capital Cost 1975-1990 Billion $1975	Total Yearly Impact * On Residential Consumer's Bill in 1990 (1975 $)
- Baseline (including current provisions of Clean Air Act)	425	1,275
Incremental Impact of Significant Deterioration Policies		
- Senate Proposal	+$19.1	+$48
- House Proposal	+$18.8 - 19.3	+$48
- Senate Proposal with current EPA definition of BACT	+$ 3.1	+$5
- House Proposal with current EPA definition of BACT	+$1.6-2.4	+$2-4

*Direct and Indirect

As indicated in Table V-8, a low growth scenario for nuclear power would significantly increase the cost of significant deterioration. For example, the capital cost of the Senate proposal increases from $11.5 to $19.1 billion and the yearly impact in 1990 from $28 per year to $48 per year. Similarly, the capital cost of the House proposal increases from between $11.2 and $11.6 billion to between $18.8 and $19.3 billion. The yearly impact in 1990 of the House proposal on the residential consumer's bill increases from $28 per year to $48 per year.

For purposes of comparison, estimates were also made for the Senate and House proposals assuming EPA's current definition of BACT. The results indicate a considerable reduction in the cost of significant deterioration. The capital cost of the Senate proposal would be $3.1 billion and the capital cost of the House proposal would be between $1.6 and $2.4. The yearly impact on the residential consumer's bill would be $5 and between $2 and $4 for the Senate and House proposals respectively.

The demand for scrubbers would increase under the nuclear moratorium scenario due to the replacement of nuclear capacity with coal-fired capacity. The estimated capacity scrubbed by 1990 under the Clean Air Act would increase from 175,000 MW to 235,000 MW. The Senate and House proposals would increase the capacity scrubbed by about 155,000 MW (i.e., an increase of 65%).

2. Energy Conservation Scenario

The cost estimates in the previous sections were based on the assumption that peak load would grow by about 5.2% between 1980 and 1990. However, there is general agreement that if the Federal government implemented energy conservation policies in general and electricity load management in particular, demand for peak generating capacity will be reduced. While it is extremely difficult to predict what the resulting growth in peak generating capacity will be, it appears that it is not unreasonable to assume that a comprehensive Federal program could reduce the growth in demand to 4.0% per year over the 1975 to 1990 period. The impact of a lower growth rate for generating capacity on capital and annual costs is summarized in Table V-9.

Table V-9

Implications of an Energy Conservation Scenario

Policy Option	Capital Cost 1975-1990 (Billion $1975)	Total Yearly Impact on Residential Customers in 1990 1/
- Baseline (in the absence of Significant Deterioration)	305	950
Incremental Impact of Significant Deterioration		
- Senate Proposal	+$7.0	+$18
- House Proposal	+$6.9-7.1	+$18
- Senate Proposal with current EPA definition of BACT	+$1.4	+$ 2
- House Proposal with current EPA definition of BACT	+$0.8-1.2	+$1-2

As indicated in Table V-9, an energy conservation scenario would considerably reduce the cost of alternative significant deterioration proposals. For example, the capital cost of the Senate proposal would be reduced from $11.5 to 7.0 billion. The comparative reduction for the House proposal would be from $11.2 and $11.6 billion to between $6.9 and $7.1 billion. Similarly, the total yearly impact of the Senate and House proposals on the residential customer would be reduced from $28 per year to $18 per year.

The demand for scrubbers would decrease under the energy conservation scenario due to the reduced growth in coal-fired capacity. The estimated capacity scrubbed by 1990 under the Clean Air Act would be reduced from 175,000 MW to 135,000 MW. The Senate and House proposals would increase the capacity scrubbed by 60,000 MW (i.e., an increase of 44%).

1/ Direct and indirect costs due to the higher price for electricity and higher prices for goods and services.

D. Analysis of Other Major Policy Issues

1. Number of Class I Areas

The importance of Class I designations in determining the impact of significant deterioration policies can be seen in Table V-10. This table shows the impact on megawatts of only the Class I areas designated in each of the proposals.

Table V-10

Percentage of Planned Capacity Potentially Impacted by Alternative Class I Designations

	Mandatory Class I Areas		Mandatory and Discretionary Class I Areas	
Policy Option	# Areas	% MW Affected	# Areas	% MW Affected
- Senate Proposal	362	4%	588	4%
- House Proposal	115	0%	201	0%
- Senate Proposal with current EPA definition of BACT	362	48%	588	54%
- House Proposal with current EPA definition of BACT	115	11%	201	22%

As indicated in the above table, the Senate mandatory and discretionary Class I areas would "affect" approximately 4% of the planned coal-fired capacity and there would not be any impact from the House Class I designations. The Senate proposal has a higher impact because the Senate proposal has about three times more Class I designations than the House proposal.

2. Allowed Class II Increments

Table V-11 summarizes the capital and annual cost if one only considers the impact of the House and Senate Class II increments.

Table V-11

Incremental Capital and Annual Cost of the House and Senate Class II Increments: 1975-1990 1/

Policy Option	Capital Cost ($ Billion)	Annual Cost ($ Billion)
- Baseline (i.e., Current provisions of CAA)	$435	$1,440
Incremental Impact of Significant Deterioration Class II Increments		
- Senate Proposal	+$11.4	+$16.3
- House Proposal	+$11.6	+$16.6
- Senate Proposal with current EPA definition of BACT	+$ 0.7	+$ 0.8
- House Proposal with current EPA definition of BACT	+$1.3	+$1.5

As indicated in the above table, the Senate Class II increments would require an additional $11.4 billion in capital expenditure and $16.3 billion in annual costs over the next 15 years. By comparison the House Class II increment would require an additional $11.6 billion in capital expenditure and $16.6 billion in annual costs. It can be concluded, therefore, that compliance with the House Class II increment would require about $0.2 billion more in capital expenditures and $0.3 more in annual costs. Although the House Class II increment for sulfur dioxide is approximately 50% of the Senate three hour increment (see Table II-1 on page II-2), the difference in costs is mitigated by the requirements that all plants install scrubbers.

Table V-11 also shows that assuming EPA's definition of BACT compliance with the House Class II increment costs about twice as much as compliance with the Senate's Class II increments. The higher costs of the House Class II increment are caused by the more restrictive 3-hour increment for sulfur dioxide and by the relaxation of the requirement that all plants install scrubbers.

3. Allowable Stack Height

Allowable stack height is important because a taller stack permits more diffusion of a power plant's emissions. Accordingly, restrictions by the Class II increment on the siting of power plants in areas of non-flat terrain could be minimized by the construction of taller stacks. Thus, for any assumed level or emission control, the use of taller stacks would allow the siting of larger plants.

1/ Assumes a stack height of 500 feet.

While both the Senate and House proposals would probably restrict allowable stack height to 500 feet, for the purposes of this analysis, the implications of allowing the use of a 1000-foot stack have been analyzed. The results of this analysis are summarized in Table V-12.

Table V-12

Impact of Allowable Stack Height on the Capital and Annual Cost of Class II Increments: 1975-1990

Policy Option	Capital Cost 1975-1990 ($ Billion)	Annual Cost 1975-1990 ($ Billion)
- Baseline (i.e., Current provisions of CAA)	$435	$1,440
Incremental Impact of Significant Deterioration Class II Increments		
- Senate Proposal		
o 500 foot stack	+$11.4	+$16.3
o 1000 foot stack	+$11.2	+$16.1
- House Proposal		
o 500 foot stack	+$11.6	+$16.6
o 1000 foot stack	+$11.2	+$16.1
- Senate Proposal with current EPA definition of BACT		
o 500 foot stack	+$ 0.7	+$ 0.8
o 1000 foot stack	+$ 0.2	+$ 0.2
- House Proposal with current EPA definition of BACT		
o 500 foot stack	+$ 1.3	+$ 1.5
o 1000 foot stack	+$ 0.9	+$ 1.0

As indicated in the above Table, allowable stack height has a relatively small impact on the capital and annual cost of alternative significant deterioration proposals. For example, the use of higher stacks only reduces the capital cost of the Class II increment of the Senate proposal from $11.4 to $11.2 billion dollars and reduces the annual cost from $16.3 to $16.1 billion. Similarly, the capital cost of the House proposal would be reduced from $11.6 to $11.2 billion and the annual cost would be reduced from $16.6 to $16.1 billion.

It can also be concluded from Table V-12 that under EPA's definition of BACT the use of tall stacks has a considerable impact on the cost of the Senate and House Class II increments. For example, the capital cost of the Senate proposal would be reduced from $0.7 to $0.2 billion and the annual cost from $0.8 to $0.2 billion. Similarly, the capital cost of the House proposal would be reduced from $1.3 to $0.9 billion and the annual cost from $1.5 to $1.0 billion.

The cost savings from the use of taller stacks must be balanced against the fact that the use of tall stacks in lieu of more stringent control of sulfur dioxide emissions (i.e., low sulfur coal or scrubbers) will result in higher levels of sulfur dioxide emissions than would otherwise result.

E. Impact of Alternative Significant Deterioration Policies on Emissions of Sulfur Dioxide

As shown in Table V-13 the Senate and House proposals will reduce sulfur dioxide emissions from electric power plants from 18.6 million tons in 1974 to 12.1 million tons in 1990. Thus, total emissions from power plants will be reduced 35% between 1974 and 1990.

Table V-13

Impact of Alternative Significant Deterioriation Policies on Emissions of Sulfur Dioxide from Electric Power Plants

	SO_2 Emissions/Yr (Million Tons)		
Policy Option	1974 Actual Emissions	1990	% Reduction 1974-1990
- Baseline (i.e., in the absence of significant deterioration)	18.6	15.6	16%
- Senate Proposal		12.1	35%
- House Proposal		12.1	35%
- Senate Proposal with current EPA definition of BACT		15.6	16%
- House Proposal with current EPA definition of BACT		15.3	18%

It can also be concluded from Table V-13 that under any of the policy options, the emission of sulfur dioxide from electric power plants will decline between 1974 and 1990. The reduction in the absence of significant deterioration would be about 16% and the reduction if the Senate and House proposals were to adopt EPA's definition of BACT would be a total reduction of 16 to 18%.

Appendix A
Expenditures of the Electric Utility Industry in The Absence of Environmental Regulations (Baseline)

SUMMARY

The Baseline was developed from a set of assumptions, of which the following are the highlights:

- Electricity sales will grow at a reduced rate from historical levels - 6.1% between 1975-80, 5.3% between 1981-85, and 5.3% between 1986-90.
- Peak growth will trail sales in the 70's and parallel sales in the 80's - 5.9% between 1976-1980, 5.2% between 1981-85, 5.3% between 1986-90.
- Coal capacity will maintain a growth rate equal to peak growth in the 1980's.
- Capital costs will escalate more rapidly than O&M costs over the next 15 years.
- Reserve margins will return to the desired rate of 20% by 1985.

A nuclear moratorium scenario was also analyzed. Under this scenario, nuclear capacity increased to 108,000 mw by 1983 and the remained constant between 1983 and 1990.

In addition, an energy conservation scenario was analyzed. Under this scenario, growth in demand is projected to slow to 4.2% annually and load management is projected to slow growth in peak demand to 4.0% over the 1975 to 1990 period.

INFLATION RATES

The inflation rates that were used in the baseline estimates are based on analysis by Temple, Barker & Sloane (TBS) and PEDCo Environmental. These estimates are summarized in Table 1.

SALES GROWTH

Under the principal baseline and nuclear moratorium scenario the sales of electricity are projected to increase 6.1%/yr. between 1976 and 1980, 5.3%/yr between 1981 and 1985, and 5.2%/yr between 1986 and 1990.

Under the energy conservation scenario the sales of electricity are projected to grow at 5%/year between 1976 and 1980 and 4%/year between 1981 and 1990.

PEAK LOAD GROWTH

Under the principal baseline and nuclear moratorium scenarios, the growth in peak load demand is projected to be 5.9%/yr between 1976 and 1980, 5.2%/yr between 1981 and 1985, and 5.3%/yr between 1986 and 1990. By comparison, the historical rate of growth has been approximately 7.6%/year.

Under the energy conservation scenario, the growth in peak demand is projected to be 4.8%/yr between 1976 and 1980 and 3.8%/yr between 1981 and 1990.

CAPACITY MIX

The projected growth in fossil and nuclear capacity for all three scenarios for the 1975 to 1980 period was taken from the Federal Power Commission's announced additions. For the post-1980 period it was assumed that the growth rate for coal-fired capacity would be equal to the growth rate for peak load demand. A summary of the implied growth rates for fossil and nuclear under each scenario is given in Table 2. A year by year capacity projection for each scenario is presented in Table 3.

CAPITAL EXPENDITURES

The projected capital expenditures used in this report are net of change in construction work in progress (CWIP). The principal baseline scenario projects capital expenditures over the 1975-1990 time period to total $400 billion (1975 dollars), in the absence of any environmental regulations. In Addition, if no new nuclear plants were allowed to come on line after 1983, but growth in peak demand remained the same (i.e. nuclear moratorium scenario), capital expenditures would total $370 million over 1975-90. The baseline is lower for the nuclear moratorium because the capital cost of fossil plants is lower than the capital cost of nuclear plants.

The projected capital expenditures under the energy conservation scenario is $275 billion (1975 dollars) over the 1975-1990 time period.

SUMMARY OF INFLATION RATES

TABLE I
(Average Percent Per Year)

Period	GNP Deflator	Nuclear Capital	Nuclear Fuel	Nuclear O&M	Coal Capital	Coal Fuel	Coal O&M	Pollution Control Equipment: Scrubbers & TCP	Pollution Control Equipment: Other	Pollution Control Equipment: Air Water
1976-1980	5.3%	8	8	5.8	12	5.8	5.8	9.0	7.4	7.4
1981-1985	4.7	7	7	4.7	12	4.7	4.7	7.6	6.4	6.4
1986-1990	5.0	7	7	5.0	12	5.0	5.0	7.6	6.0	6.0

Table 2

MAIN BASELINE SCENARIO

Period	Coal		Nuclear	
	Additions (MW)	Annual Growth Rate	Additions (MW)	Annual Growth Rate
1976-1980	67.9	6.2%	39	14.4%
1981-1985	75.0	5.2%	47	10.0%
1986-1990	102.7	5.3%	101.7	12.5%

NUCLEAR MORATORIUM SCENARIO

Period	Coal		Nuclear	
	Additions (MW)	Annual Growth Rate	Additions (MW)	Annual Growth Rate
1976-1980	67.9	6.2%	39.0	14.4%
1981-1985	94.5	5.9%	28.3	6.2%
1986-1990	208.4	9.4%	0.0	0.0%

ENERGY CONSERVATION SCENARIO

Period	Coal		Nuclear	
	Additions (MW)	Annual Growth Rate	Additions (MW)	Annual Growth Rate
1976-1980	67.9	6.2%	38.9	14.4%
1981-1985	50.2	3.3%	32.1	7.8%
1986-1990	54.0	3.1%	54.0	8.2%

TABLE A-3

GROWTH IN CAPACITY BY [illegible] (Thousand Megawatts)
(M [illegible] n Baseline Scenario)

CAPACITY REPORT

	TOTAL FOSSIL	COAL	OIL	GAS	NUCLEAR	HYDRO	PUMPED STORAGE	IC/GT
1973	323.3	176.3	60.7	86.2	21.1	54.5	7.3	33.7
1974	339.4	185.8	66.3	87.4	31.6	55.4	8.3	41.3
1975	357.8	196.6	71.9	89.2	40.7	57.6	8.5	44.8
1976	366.4	207.1	78.4	80.9	49.0	58.9	10.0	46.2
1977	378.4	221.5	85.3	71.6	54.5	61.1	10.4	48.1
1978	390.8	238.8	88.2	63.8	61.7	63.8	11.2	50.6
1979	407.3	260.5	90.7	55.9	67.2	64.5	11.4	51.9
1980	421.1	287.1	85.8	48.1	79.7	66.4	11.8	52.0
1981	426.0	284.3	84.9	46.8	86.0	67.3	12.4	53.5
1982	430.9	331.6	83.9	45.4	92.4	68.3	12.9	54.9
1983	435.8	338.9	82.9	44.0	99.9	69.1	13.6	56.4
1984	440.7	316.1	82.0	42.6	105.3	70.1	14.2	57.8
1985	445.5	323.4	80.9	41.2	111.8	71.1	14.8	59.3
1986	448.5	328.9	79.9	39.7	120.1	72.0	15.4	60.7
1987	451.5	334.2	78.9	38.3	128.5	73.0	16.0	62.2
1988	455.1	340.4	77.9	36.8	137.5	74.0	16.7	63.8
1989	463.6	351.4	76.8	35.3	151.5	75.6	17.7	66.5
1990	472.5	362.8	75.8	33.8	165.9	77.3	18.8	69.4

TABLE A-4
NUCLEAR MORATORIUM SCENARIO

	TOTAL FOSSIL	COAL	OIL	GAS	NUCLEAR	HYDRO	PUMPED STORAGE	IC/GT
1973	323.3	176.3	60.7	86.2	21.1	54.5	7.3	33.7
1974	339.4	185.8	66.3	87.4	31.6	55.4	8.3	41.3
1975	357.8	196.6	71.9	89.2	40.7	57.6	8.5	44.8
1976	366.4	207.1	78.4	80.9	49.0	58.9	10.0	46.2
1977	378.4	221.5	85.3	71.6	54.5	61.1	10.4	48.1
1978	390.8	238.8	88.2	63.8	61.7	63.8	11.2	50.6
1979	407.3	260.5	90.7	55.9	67.2	64.5	11.4	51.9
1980	421.1	287.1	85.8	48.1	79.7	66.4	11.8	52.0
1981	431.4	299.8	84.9	47.8	89.5	67.8	12.4	53.5
1982	440.5	311.2	83.9	45.4	98.4	68.2	12.9	54.9
1983	449.9	323.0	82.9	43.9	108.0	70.6	13.6	56.4
1984	460.2	344.9	81.9	42.5	108.0	72.0	14.3	57.8
1985	470.1	367.3	80.8	41.0	109.0	73.5	14.7	59.0
1986	520.6	401.5	79.7	39.4	108.0	75.7	15.1	60.5
1987	553.8	437.5	78.5	37.7	108.0	78.1	15.8	62.1
1988	589.7	475.5	77.3	36.0	108.0	80.6	16.6	63.8
1989	625.5	513.5	75.9	34.0	108.0	83.1	17.5	65.5
1990	664.2	557.7	74.5	32.0	108.0	85.8	18.4	67.3

TABLE A-5
ENERGY CONSERVATION SCENARIO

CAPACITY REPORT

	TOTAL FOSSIL	COAL	OIL	GAS	NUCLEAR	HYDRO	PUMPED STORAGE	IC/GT
1973	323.3	176.3	60.7	86.2	21.1	54.5	7.3	33.7
1974	339.4	185.8	66.3	87.4	31.6	55.4	8.3	41.3
1975	357.8	196.6	71.9	89.2	40.7	57.6	8.5	44.8
1976	366.4	207.1	78.4	80.9	49.0	58.9	10.0	46.2
1977	378.4	221.5	85.3	71.6	54.5	61.1	10.4	48.1
1978	390.8	238.8	88.2	63.8	61.7	63.8	11.2	50.6
1979	407.3	260.5	90.7	55.9	67.2	64.5	11.4	51.9
1980	421.1	287.1	85.8	48.1	79.7	66.4	11.8	52.0
1981	426.0	284.3	84.9	46.8	86.0	67.3	12.4	53.5
1982	430.9	331.6	83.9	45.4	92.4	68.3	12.9	54.9
1983	435.8	338.9	82.9	44.0	99.9	69.1	13.6	56.4
1984	440.7	316.1	82.0	42.6	105.3	70.1	14.2	57.8
1985	445.5	323.4	80.9	41.2	111.8	71.1	14.8	59.3
1986	448.5	328.9	79.9	39.7	120.1	72.0	15.4	60.7
1987	451.5	334.2	78.9	38.3	128.5	73.0	16.0	62.2
1988	455.1	340.4	77.9	36.8	137.5	74.0	16.7	63.8
1989	463.6	351.4	76.8	35.3	151.5	75.6	17.7	66.5
1990	472.5	362.8	75.8	33.8	165.9	77.3	18.8	69.4

ANNUAL COST

Operating revenues represent the total amount paid by utility customers for electricity in a given period. It represents the base for comparison of potential impacts of pollution control regulations which require capital investments as well as direct operating costs. The main baseline projection for total utility operating revenues are $1,335 billion (1975 dollars) between 1975 and 1990. The annual revenue requirements for the principal baseline increases from $60 billion in 1975 to $120 billion in 1990 (1975 dollars).

The nuclear moratorium scenario would require $1,34o billlion for 1975-90.

The energy conservation scenario would require $1,195 billion between 1975 and 1990.

APPENDIX B

Impact of Alternative Significant Deterioration Policies on Coal Production

Summary

Alternative significant deterioration policies will impact the sources and uses of coal over the 1980-1990 decade. The requirement in the Senate and House proposals to install best available control technology is projected to reduce the demand for western coal in 1990 from 690 million tons under the Clean Air Act (i.e., no significant deterioration requirements) to 655 million tons under the Senate and House proposals. The Senate and House proposals would increase the demand for mid-western coal in 1990 from 125 million tons to 150 million tons.

Methodology

Demand

The total demand for coal was estimated from the generating capacity projected to come on line between 1975 and 1990 (see Appendix A). New coal-fired plants were assumed to operate at a 65% capacity factor with the following heat rates:

Coal Type	BTU per kwh
Bituminous	9,500
Sub-Bituminous	9,700
Lignite	10,500

The heat content of coals were assumed on the basis of likely coal source.

a. Clean Air Act Case. The Clean Air Act without NSD requires new plants to meet NSPS or SIP whichever is more stringent and to comply with national ambient air quality standards (NAAQS). This analysis assumed that plants would use the coal which would be the least expensive on a $/Million BTU basis (including transportation cost and cost of required pollution control) to comply with the current provisions of the Clean Air Act.

b. Significant Deterioration Cases

The Senate and House proposals' definition of best available control technology will probably require all post-1980 coal-fired power plants to install scrubbers and use coals of moderate sulfur content . As a result, the plants would use whatever coal was the cheapest regardless of sulfur content. Therefore these policies would increase the demand for local coals and decrease the demand for shipped-in low sulfur coal. Based on an analysis of coal production and reserves in the regions indicated in Figure B-1, the coal types which were assumed to be scrubbed for this analysis were:

Coal Region	Coal Type	Sulfur Content
East	Washed High Sulfur coal or Medium Sulfur coal	3.2 lb SO2/Million BTU
Central	Washed High Sulfur coal or Medium Sulfur coal	4.6 lb SO2/Million BTU
West	Western low sulfur coal	1.2 lb SO2/Million BTU
Texas/Louisiana	Lignite	2.5 lb SO2/Million BTU

Projected Supply of Coal.

Regional forecasts of total coal production assuming no significant deterioration proposals (i.e., CAA) were, with the exception of Texas, calculated from the National Coal Association's forecast of new mine openings and expansions (Keystone News Bulletin; August, 1975). Texas production was assumed to match consumption forecasts, with an upper limit of 55 million tons available. Old mines in the east and central regions were exhausted at 1/30 of 1973 output. New small mines which account for about half of total new production in the East.) Changes in the projected coal production under the CAA were then estimated for each of the significant deterioration policies.

Figure I-1

Coal Producing/Consuming Regions

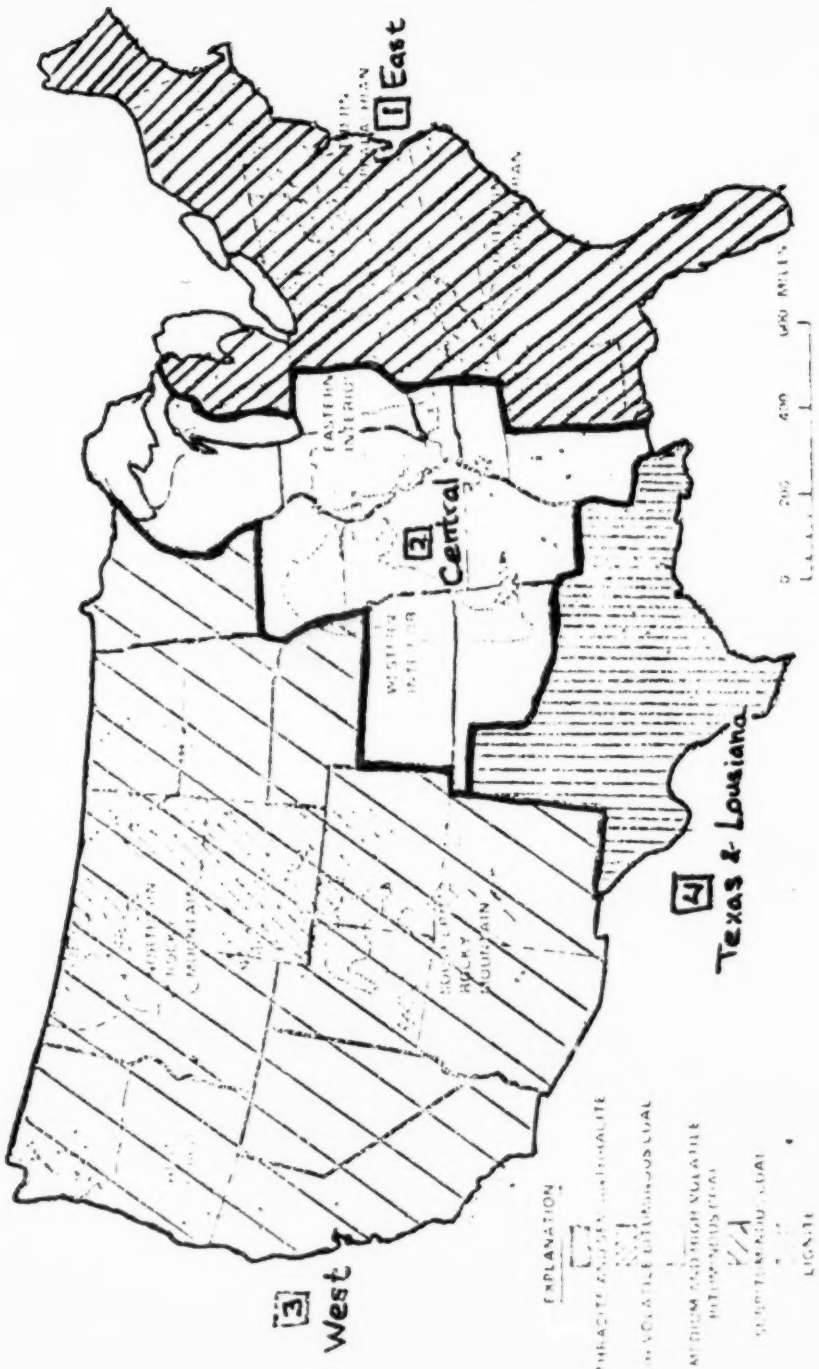


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Table B-1 summarizes the projected production of coal for electric utilities by region assuming no significant deterioration requirements (i.e., CAA case). As can be seen, the production of eastern, midwestern and western coal for utility use is projected to be 234, 117 and 618 million tons in 1990 respectively. 1/

Table B-2 is the production forecast for electric utilities under the Senate and House significant deterioration proposals. This analysis assumes that Senate and House definition of BACT would require scrubbers on all post-1980 coal-fired plants. As shown in Table B-2, the production of Northern Plains coal in 1990 is reduced from 468 to 434 million tons and the production of central coal is increased from 117 to 141 million tons. Table B-3 is the production forecast for non-utility users. Table B-4 is the production forecast for all coal uses, utility and non-utility.

1/ For this analysis, the western region consists of the coal fields of Texas, northern plains, southwest, and Washington.

In Tables B-1 through B-4: Eastern Region is AL, MD, OH, PA, TN, VA, WV, eastern KY; Central is AR, IL, IN, IA, KS, MO, OK, western KY; N. Plains is MT, ND, WY; Texas is TX, LA; Southwest is AZ, CO, NM, UT; Pacific is WA. Low sulfur coal contains no more than 1.20 pounds SO_2 per million gross BTU; Medium contains 1.21-3.20 pounds; High contains more than 3.20 pounds.

TABLE B-1
CLEAN AIR ACT CASE
ESTIMATED PRODUCTION OF COAL IN THE UNITED STATES
For Electric Generating Utilities
(All Ranks, Excluding Alaska)

	Producing Region and Sulfur Class															
	East				Central		N. Plains			Tex.	Southwest			Pac.	
	Low	Med.	High	Und.[1]	Med.	High	Low	Med.	Und.[1]	Med.	Low	Med.	Und.[1]	Med.	Total
1973 Actual Production	6	98	96		7	113	12	20		5	8	9		3	377
Production Changes'73-'80															
Output from New Mines		73	1		5	51[3]	85	39		25	21	19		3	322
Exhaustion of Old Mines[2]	(2)	(23)	(22)		(1)	(26)									(74)
Reallocated from Non-Ut.[2]						6		1							7
1980 Forecast Production	4	148	75		11	144[3]	97	60		30	29	28		6	632
Production Changes'80-'85															
Output from New Mines		1	16	13			114	12		23	9	6		1	194
Exhaustion of Old Mines[2]	(1)	(17)	(16)		(1)	(19)									(54)
Reallocated from Non-Ut.[2]			2			3									5
1985 Estimated Production	3	125	59		10	115[3]	97	58		30	27	27		6	557
For Pre-mid-'80 Plants		7	18	13		13	104	14		23	11	7			220
For Post-mid-'80 Plants	3	132	77	13	10	128	211	72		53[4]	38	34		6	777
Total															
Production Changes'85-'90															
Output from New Mines		1	24	17			171	19			12	9			254
Exhaustion of Old Mines	(1)	(16)	(16)		(2)	(19)	(2)	(3)		(1)	(1)	(1)			(62)
1990 Estimated Production	2	102	43		8	80[3]	97	56		30	25	26		6	475
For Pre-mid-'80 Plants		15	42	30		29	283	32		23	24	16			404
For Post-mid-'80 Plants	2	117	85	30	8	109	380	88		53[4]	49	42[4]		6[4]	969
Total															

1) "Undefined" - the cheapest available coal can be utilized, whether low, medium or high sulfur.

2) See Part A of this Exhibit.

3) This is 35 million tons more than is required to meet demand in '80, 22 more in '85, and 7 more in '90.

4) Estimated maximum long-run sustainable output from known surface-minable reserve base.

12/1/75

Table B-2

BACT CASE

ESTIMATED PRODUCTION OF COAL IN THE UNITED STATES

For Electric Generating Utilities
(All Ranks, Excluding Alaska)

	Producing Region and Sulfur Class															
	East				Central		N. Plains			Tex.	Southwest			Pac.		
	Low	Med.	High	Und.[1]	Med.	High	Low	Med.	Und.[1]	Med.	Low	Med.	Und.[1]	Med.	Total
1973 Actual Production	6	93	96		7	113	12	20		5	8	9		3	377
Production Changes'73-'80															
Output from New Mines		73	1		5	51[3]	85	39		25	21	19		3	322
Exhaustion of Old Mines	(2)	(23)	(22)		(1)	(26)									(74)
Reallocated from Non-Ut.[2]						6		1							7
1980 Forecast Production	4	148	75		11	144[3]	97	60		30	29	28		6	632
Production Changes'80-'85							10	101		23	6	9		1	194
Output from New Mines		14	20			10									(54)
Exhaustion of Old Mines	(1)	(17)	(16)		(1)	(19)									5
Reallocated from Non-Ut.[2]			2			3									
1985 Estimated Production							97	58		30	27	27		6	557
For Pre-mid-'80 Plants	3	125	59		10	115[3]	10	103		23	8	10		1	220
For Post-mid-'80 Plants		20	22			23				5[4]					
Total	3	145	81	—	10	138	107	161		53[4]	35	37		7	777
Production Changes'85-'90															
Output from New Mines		18	28			14	14	157		1	15	6		1	254
Exhaustion of Old Mines	(1)	(16)	(16)		(2)	(19)	(2)	(3)		(1)	(1)	(1)			(62)
1990 Estimated Production							97	56		30	25	26		6	475
For Pre-mid-'80 Plants	2	102	43		8	80[3]	53	22		23	24	16		2	404
For Post-mid-'80 Plants		45	50			53	119	259		5[4]	49	42		8[4]	969
Total	2	147	93	—	8	133		315		53[4]					

1) "Undefined" - the cheapest available coal can be utilized, whether low, medium or high sulfur.

2) See Part A of this Exhibit.

3) This is 35 million tons more than is required to meet demand in '80, 22 more in '85, and 7 more in '90.

4) Estimated maximum long-run sustainable output from known surface-minable reserve base.

TABLE B-3

ESTIMATED PRODUCTION OF COAL IN THE UNITED STATES

For All Uses by Region, Steaming Coke, Other Industries and Utilities

(Net Tons, Excluding Waste)

	Production Region and Sulfur Class											
	Appalachia			Interior		Texas	Gulf	Lignite	Colorado	Rocky Mtn.	Pac. Nw.	Total
	Low	Med.	High	Low	High	Low	Gulf		Low	Med.		
1973 Actual Production												
For Export	41	6	6									53
For Coke & Gas Mfg.	25	5	2	3								35
For Steam Coal	33	11	16	3	22		1	2	3	3		94
Total	99	22	24	6	22		1	2	3	3		182
Production Changes '73-'80												
Output from New Mines	56	25	1	2		13				2	1	102
Exhaustion of Old Mines	(15)	(21)	(6)	(2)	(5)							(49)
Reallocate to Utilities[1]					(6)		(1)					(7)
1980 Forecast Production												
For Export	67	22	9	1							1	100
For Coke & Gas Mfg.	29	53		5								87
For Steam Coal	51	12	15	1	10	13		1	3	3		109
Total	147	87	24	7	10	13		1	3	3	1	296
Production Changes '80-'85												
Output from New Mines	32	18				13			1			65
Exhaustion of Old Mines	(11)	(15)	(4)	(1)	(4)							(35)
Reallocate to Utilities[1]			(2)		(3)							(5)
1985 Estimated Production												
For Export	55	25	10	1							1	92
For Coke & Gas Mfg.	27	53	1	5								86
For Steam Coal	54	22	13	2	7	26		1	3	3		131
Total	136	100	24	8	7	26		2	3	3	1	309
Production Changes '85-'90												
Output from New Mines	14	11	5	2		29			4	2		68
Exhaustion of Old Mines	(11)	(11)	(4)	(2)	(2)							(30)
1990 Estimated Production												
For Export	58	25	10	1							1	95
For Coke & Gas Mfg.	30	53	1	5								89
For Steam Coal	54	33	14	3	5	55		1	7	5	1	178
Total	142	111	25	9	5	55		2	7	5	2	362

1) Reflects historically rapid rate of writeoff of new coal mines by coal-burning utilities.

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TABLE B-4

ESTIMATED PRODUCTION OF COAL IN THE UNITED STATES
(MILLIONS OF TONS/YR.)

TOTAL FOR ALL USES INCLUDING ELECTRIC UTILITY AND NON-UTILITY
(All ranks exculding Alaska)

Producing Region and Sulfur Class [1]

Clean Air Act Case	EAST				CENTRAL		N. PLAINS			TEXAS	SOUTHWEST			PACIFIC	
	LOW	MED	HIGH	UNDEFINED	MED	HIGH	LOW	MED	UNDEFINED	MED	LOW	MED	UNDEFINED	MED	TOTAL
1973	72	190	120		15	134	12	21		7	12	12		3	598
1980	111	245	94		19	154	112	60		32	33	32		7	899
1985	156	232	90	13	17	131	245		72	55	43		38	7	1099
1990	198	229	99	30	16	109	433		88	55	57		46	7	1367
BACT Case															
1973	72	190	120		15	134	12	21		7	12	12		3	598
1980	111	245	94		19	154	112	60		32	33	32		7	899
1985	156	245	94		17	141	141		161	55	40	4	37	8	1099
1990	198	259	107		16	133	172		315	55	57	4	42	9	1367

[1] Low sulfur is 1.2 lb. SO_2/million BTU, medium sulfur is 1.21 lb. SO_2 to 3.20 lb. SO_2/million BTU and high sulfur is greater than 3.20 lb. SO_2/million BTU

APPENDIX C

SUMMARY OF METHODOLOGY TO ESTIMATE COSTS INCURRED BY IMPACTED POWER PLANTS

To develop reasonable estimates of the economic impact on the electric utility industry resulting from alternative policies intended to prevent the significant deterioration of air quality, EPA and FEA have assessed the impact on a sample of 74 proposed new coal-fired power plants believed to be indicative of the power development that would occur during 1980-1990 in the absence of significant deterioration regulation. An initial analysis of the 74 plants using meteorological dispersion models categorized plants as: (1) Probably Restricted; (2) Possibly Restricted; and (3) Unlikely Restricted by the provisions of the House and Senate proposals and a number of other policy options. 1/ The plants identified as "Probably Restricted" or "Possibly Restricted" were then re-examined to assess the likely response of the utility to significant deterioration regulation and the resulting impact on power plant costs. The methodology used in this analysis is summarized in figure C-1 and is discussed below.

A. Class I and Class II Review

The first step of the study was to screen the power plants initially identified as restricted to determine those plants restricted by the designated Class I areas and/or the Class II increment. Briefly, the screening process reviewed each plant with the same plant capacity, emission rate and distance relationships used in the initial analysis to verify the degree of restriction and eliminate those least likely to be restricted. In effect the review moved a number of plants from the "Possibly Restricted" to the "Unlikely Restricted" category for each of the policy alternatives considered.

B. Cost of Compliance

Power plants which could not comply with the significant deterioration requirements were assumed to comply through the least cost combination of reducing the level of emissions and/or resiting all or part of the power plant.

1. Reduction of Emissions

Three alternatives were available for reducing emissions -- installation of additional scrubbing, washing of coal, and blending of coal. In general, if some scrubbing is already planned for the the plant, the installation of additional scrubbing is the most economical alternative.

1/ The initial analysis employed the methodology described in Appendices B and C of the EPA/FEA publication entitled An Analysis of the Impact on the Electric Utility Industry of Alternative Approaches to Significant Deterioration, FEA/D-75/585, October 1975.

Blending, washing, or low sulfur coal were considered as alternatives when 100 percent flue gas treatment was already called for.

2. Resiting

Another alternative for compliance with Class I or Class II requirements was relocation of the proposed plant in whole or part to another site. In the selection of alternative sites, consideration was given to cooling water requirements, proximity of transmission lines and substations, availability of rail or barge transportation, utility service territory and location of population centers.

Water Supply. Availability of cooling water was based upon stream flow information and maps showing the location of reservoirs. Where appropriate, the cost of aqueducts (piping and pumping costs) were included in the resiting cost. No investigations were made to determine whether or not the cooling water would, in fact, be released for use by the utility.

Transmission Lines. The cost of transmission facilities associated with resiting were based upon the figures in Table C-1. The required number of lines was based upon the plant capacity and the line voltage in use in general area. Transmission investment was based upon the distance from the originally proposed site or the distance to existing or proposed transmission facilities of adequate capability. Load flow, short-circuit duty, and energy dispatch were not investigated.

Site Development Cost. An average surcharge of 5% of the total capital cost of a new plant was added to the cost of impacted power plants scheduled to come on-line between 1980 and 1985 to reflect possible added expense in site selection, site related construction costs, and the environmental review process. For purposes of the analysis, it was assumed that post-1985 plants were not committed to a specific site and that, on the average, there would be only a negligible increase in site related costs.

Economies of Scale. In those situations where only a portion of the capacity was relocated or if capacity were relocated to more than one alternative site, direct and indirect economy of scale costs for the land and physical plant were estimated using information contained in USAEC Publication WASH-1345 entitled "Power Plant Capital Cost: Current Trends and Sensitivity to Economic Parameters," October 1974.

Fuel Penalties. Fuel penalties were included to cover the added cost of burning higher cost coal and the added cost of rail and/or barge transportation.

FIGURE C-1

FLOW CHART OF METHODOLOGY
FOR CALCULATING THE COST INCURRED
BY IMPACTED POWER PLANTS

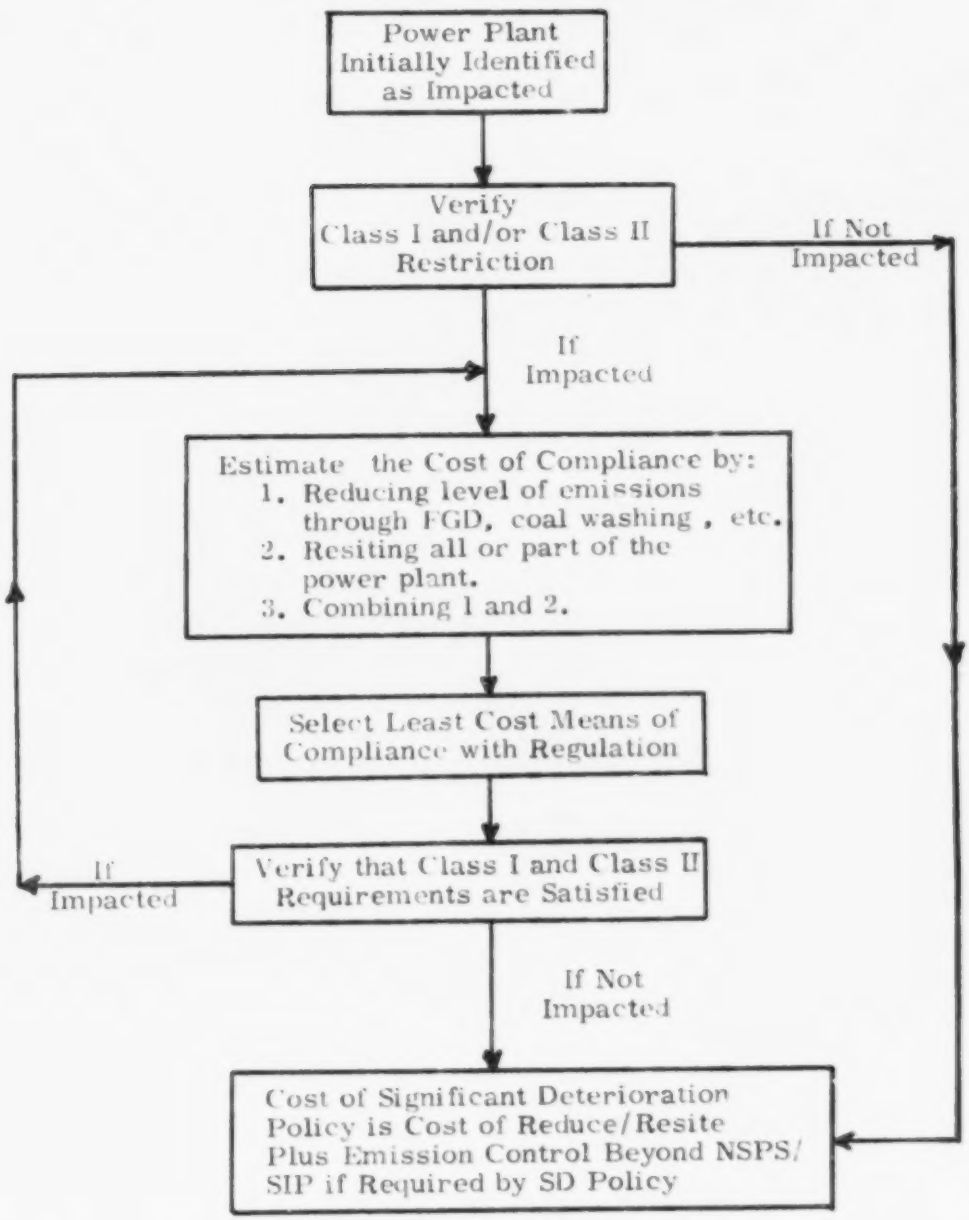
Power Plant Initially Identified as Impacted
Verify Class I and/or Class II Restriction
If Not Impacted
If Impacted
Estimate the Cost of Compliance by:
1. Reducing level of emissions through FGD, coal washing, etc.
2. Resiting all or part of the power plant.
3. Combining 1 and 2.
Select Least Cost Means of Compliance with Regulation
Verify that Class I and Class II Requirements are Satisfied
If Impacted
If Not Impacted
Cost of Significant Deterioration Policy is Cost of Reduce/Resite Plus Emission Control Beyond NSPS/SIP if Required by SD Policy

TABLE C-1

TRANSMISSION LINE COST ESTIMATES

	Rural $/Mile	Suburban $/Mile	Mw
230 Kv	$ 90,000	$115,000	250
345 Kv	$125,000	$160,000	500
500 Kv	$180,000	$230,000	1,000
765 Kv	$315,000	$415,000	2,000

O & M

	Rural $/Mile/Year	Suburban $/Mile/Year
230 Kv	$360	$460
345 Kv	$500	$640
500 Kv	$720	$920
765 Kv	$1,260	$1,660